Remarks

Claims 1-29 are currently pending in the present application. Claims 1-29 stand rejected. It is respectfully submitted that the pending claims define allowable subject matter.

Claims 1-28 have been rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-18, 20 and 21 of US 7108658 (hereinafter referred to as "the '658 Patent"). With respect to the double patenting rejections, Applicants submit that the pending claims 1-29 define patentably distinct inventions as compared to claims 1-18, 20 and 21 of the '658 Patent. Notwithstanding, in the event that the sole remaining issue is the double patenting rejection, Applicants reserve the right and opportunity to submit a terminal disclaimer at such time.

Claims 1, 2, 5-7, 9, 10, 13, 14, 16-18, 21, 23, 24, 28 and 29 have been rejected under 35 USC § 103(a) as being unpatentable over Duarte (US 6463181) in view of Brandl (US 6450962). Claims 3, 4, 7, 8, 11, 12, 14, 15, 19-22 and 25-28 have been rejected under 35 USC § 103(a) as being unpatentable over Duarte in view of Brandl and further in view of Argiro (US 5986661). Applicants respectfully traverse these rejections for reasons set forth hereafter.

Independent Claim 1, as amended, recites, in part, "processing said plane within said volume data set using a plurality of image enhancing techniques to form multiple enhanced images, each of said multiple enhanced images being enhanced using a different image enhancing technique that enhances a different anatomic feature, the processing configurable to allow processing in real-time while acquiring said ultrasonic volume data set and configurable to allow processing after said ultrasonic volume data set is stored."

Independent Claim 9, as amended, recites, in part, "processing said data set within said plane using a plurality of image enhancing techniques, the processing configurable to allow processing in real-time while acquiring said data set and configurable to allow processing after said data set is stored; and presenting multiple images based on said data set within said plane, each of said multiple images being processed with a different image enhancing technique that enhances a different anatomic feature, said multiple images being presented simultaneously."

Independent claim 17, as amended, recites, in part, "a processor for processing said series of adjacent scan planes, said processor identifying a plane having at least one thickness within said volumetric data set being transverse to said series of adjacent scan planes, said processor processing said plane using a plurality of image enhancing techniques, said processor configured to process both in real-time while receiving said ultrasound signals and after said volumetric data set is stored; and an output for presenting multiple images simultaneously, each of said multiple images being processed with a different image enhancing technique that enhances a different anatomic feature."

The Office Action asserts that Duarte describes applying a variety of enhancement methods for the purpose of better visualization of certain types of features. Thus the operator may visually review multiple images of the same image volume wherein each image is enhanced using a different enhancing method to enhance a specific anatomic feature in the image. However, the method described by Duarte does not use a different image enhancing technique to enhance different anatomic features in the same image volume and then present the multiple enhanced images simultaneously, wherein each enhanced image depicts a different anatomic feature.

In contrast, the system described by Duarte is limited to enhancing a single anatomical feature and then displaying the single anatomical feature. Duarte specifically describes that an image is enhanced using a single enhancement method that is selected by the operator based on the feature which the operator desires to more clearly view. For example, Duarte initially generates a coefficient map of the image. The coefficient map is then processed according to the selected enhancement method. As explained by Duarte, only one image is enhanced using the single enhancement method. Once enhanced the image is viewable to the operator. However, the system described by Duarte contrasts only the anatomical feature that is of interest to the operator. Thus, Duarte generates a single image that enhances only a single feature whereas other anatomical features in the image are not enhanced.

Duarte recognizes this shortcoming by stating that the GUI allows the physician to select the enhancement method and processing tradeoffs. Because Duarte enhances only a single image using the enhancement procedure, the processing tradeoffs referred to by Duarte are the

reduced enhancement of various other features in the image. Specifically, Duarte recognizes that by utilizing one enhancement method to enhance a single anatomical feature, other anatomical features in the same image are made less viewable or more unclear to the operator. Duarte further acknowledges that "[b]ecause the overall goal is to make suspicious features in digital images more visually apparent, these techniques increase the contrast for features of interest and reduce the contrast for surrounding tissue." Specifically, because Duarte only utilizes a single enhancement method to generate a single enhanced image, the enhancement method must be directed to the specific feature that the operator wishes to examine, while the remaining portions of the same image are significantly degraded. Duarte explains that various enhancement techniques may be utilized to enhance various features in the image, however, the enhancement techniques are only applied individually on the image. In no case does Duarte use a different image enhancing technique to enhance different anatomic features in the same image and then present the multiple enhanced images simultaneously, wherein each enhanced image depicts a different anatomic feature.

The Office Action further asserts that Duarte describes displaying enhanced features simultaneously. Applicant disagrees. Duarte only describes enhancing a single image using a single enhancement method which necessarily degrades other portions of the same image. To support this rejection the Office Action cites to Duarte Figure 1, element 26. As explained by Duarte in Figure 1, "[t]he raw image 15 is displayed proximate the processed, enhanced image(s) or image segment(s) 17a-17c on a monitor or other display device 26 connected to the data processing system 10." Duarte does not describe that the images shown in Figure 1 are enhanced using different enhancement techniques. In contrast, Applicants submit that Duarte clearly describes that a single enhancement technique is applied to the image. After viewing, for example the display in Figure 1, the operator may then select a different enhancement technique. However, because Duarte does not explain what the images in Figure 1 illustrate, nor how the images were enhanced, Applicants submit that Duarte provides no teaching to form the basis of the pending rejection.

Moreover, Brandl does not make up for this deficiency. Brandl, similar to Duarte, describes contrasting a single image over time. Thus, different articles within the image are all

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enhanced using the same contrast enhancement technique and therefore certain features are necessarily degraded.

Therefore, Claims 1, 9 and 17 are considered to be patentable over the cited art. Claims 2, 5-7, 10, 13, 14, 16, 18, 21, 23, 24, 28 and 29 depend from claims 1, 9, and 17 respectively. Therefore Claims 2, 5-7, 10, 13, 14, 16, 18, 21, 23, 24, 28 and 29 are submitted to be patentable over the cited art based at least on the dependency of these claims from the independent claims.

The rejection of Claims 3, 4, 7, 8, 11, 12, 14, 15, 19-22 and 25-28 as being unpatentable over Duarte and Brandl and further in view of Argiro (U.S. Patent 5,986,661) is respectfully traversed.

As discussed above, neither Duarte nor Brandl describe using a different image enhancing technique to enhance different anatomic features in the same image volume and then presenting the multiple enhanced images simultaneously, wherein each enhanced image depicts a different anatomic feature. Argiro does not make up for this deficiency. Argiro is directed to volumetric reconstruction. Argiro does not describe the image enhancement methods recited in the claims. Therefore, Claims 3, 4, 7, 8, 11, 12, 14, 15, 19-22 and 25-28 are therefore submitted to be patentable over the cited art. Moreover, there may be additional reasons Claims 3, 4, 7, 8, 11, 12, 14, 15, 19-22 and 25-28 are patentable over the cited art.

For example, Claim 8 recites "identifying thicknesses of said plane for each of said multiple enhanced images" and "wherein the processing said plane within said volume data set being based on said thicknesses, each of said multiple enhanced images being based on a different thickness." The Office Action admits on Page 4 that both Duarte and Brandl fail to describe the recitations of Claim 8. Applicants submit that Argiro fails to make up for these deficiencies. Specifically, Argiro adjusts the thickness of all of the displayed slices simultaneously, stating that "thickness slider 300 permits a user to enlarge the size of the slices shown in the MPR views of subwindows 310, 312 and 316" (Col. 23, lines 23-25). Therefore, Argiro is silent with respect to identifying a different thickness for each plane.

Claim 12 recites "identifying a depth based on said data set, said plane having different thicknesses based on at least one of said depth and said different image enhancing techniques."

Dependent claim 19 recites "an input for identifying the plane within said volumetric data set; said processor identifying a depth based on said volumetric data set" and "at least one thickness control setting said at least one thickness based on at least one of said depth and said image enhancing techniques." Argiro, however, states that "[w]hen examination viewer component 114 is first entered from image gallery component 112, the MPR two-dimensional images automatically show the middle slice of the viewing orientation." (Col. 22, lines 44-47). Therefore, Argiro does not identify a depth based on the data set, but instead uses the same depth, the middle slice, for presenting all data sets. Also, as Argiro does not identify the depth, Argiro does not disclose the recitation of having different thicknesses based on at least one of said depth and said different image enhancing techniques nor the recitation of setting at least one thickness based on at least one of said depth and said image enhancing techniques.

Claim 22 recites, in part, "said transducer further comprising having a transducer type, said processor further comprising identifying a subset of said image enhancing techniques based on said transducer type." Argiro is not concerned with a transducer type and does not disclose identifying a subset of said image enhancing techniques based on said transducer type. For at least the reasons stated above.

Applicants further submit that the dependent claims recite additional subject matter neither anticipated nor rendered obvious by the cited art. Moreover, the dependent claims are allowable based at least on the dependency of these claims from the independent claims.

In view of the foregoing amendments and remarks, it is respectfully submitted that the cited references neither anticipate nor render obvious the claimed invention. Should anything remain in order to place the present application in condition for allowance, the Examiner is kindly invited to contact the undersigned at the telephone number listed below.

Respectfully Submitted,

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Phillip A. Shipley, Reg. No.: 51357
THE SMALL PATENT LAW GROUP, LLP
225 South Meramec, Suite 725
St. Louis, Missouri 63105
(314) 584-4091